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$\therefore$ Distance of focus from center$=\sqrt{\dfrac{A-B}{m}}$.

Let $\theta$=the angle the principal axes make with the sides. then if $u$, $v$ be the coördinates of the focus, we easily get ·

$$u=\sqrt{\frac{A-B}{m}}\cos\theta,\quad v=\sqrt{\frac{A-B}{m}}\sin\theta.$$

$$\therefore\ u^2+v^2=\frac{A-B}{m},\quad u^2-v^2=\frac{A-B}{m}\cos2\theta.$$

From problem 94, solution on page 48, Vol. VII, No. 2, we get

$$u^2+v^2=\tfrac{1}{12}\sqrt{[a^4+b^4+2a^2b^2\cos2\beta]}.$$

$$u^2-v^2=\tfrac{1}{12}(a^2+b^2\cos2\beta).$$

Eliminating $\cos2\beta$ we get

$$144(u^2+v^2)^2=24a^2(u^2-v^2)-a^4+b^4.$$

Let $u=r\cos\varphi$, $v=r\sin\varphi$.

$\therefore$ $144r^4=24a^2r^2\cos2\varphi-a^4+b^4$, or $r^4=\frac{1}{6}a^2r^2\cos2\varphi-a^4/144+b^4/144$.

If $a=b$, $r^2=\frac{1}{6}a^2\cos2\varphi$.

**104. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pa.**

From a locomotive and tender standing still on a bridge, the pressure on the bridge is $p_1=80$ tons. The track is supposed to be straight and practically horizontal. Had the locomotive and tender been running at the rate of $r=60$ miles an hour, how many tons would the pressure on the bridge have been?

**Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.**

$p_1=80$ tons$=W=mg$.

Both $m$ and $g$ are constant.

$\therefore$ The pressure is the same, 80 tons, no matter what the velocity.

## DIOPHANTINE ANALYSIS.

**83. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.**

Find three numbers in arithmetical progression whose sum is a square and cube.

**I. Solution by J. W. YOUNG, Cornell University, Ithica, N. Y.; B. L. REMICK, Bradley Polytechnic Institute, Peoria, Ill.; and ALOIS F. KOVARIK, Decorah Institute, Decorah, Ia.**

A number which is a square and a cube is a sixth-power.

Also three numbers in arithmetical progression may be represented by

$$a-d.\ a,\ a+d;\ \text{whose sum is } 3a.$$